July 6, 1926. 1,591,733

L. E. ARNOLD

SPLASH FEED LUBRICATION ORGANIZATION

Filed June 4, 1924 2 Sheets-Sheet 1

Fig. 1.

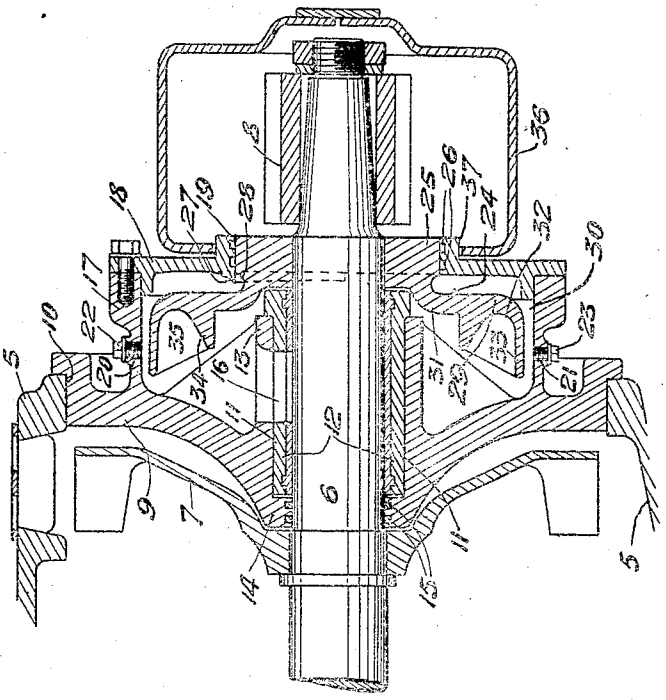

Fig. 2.

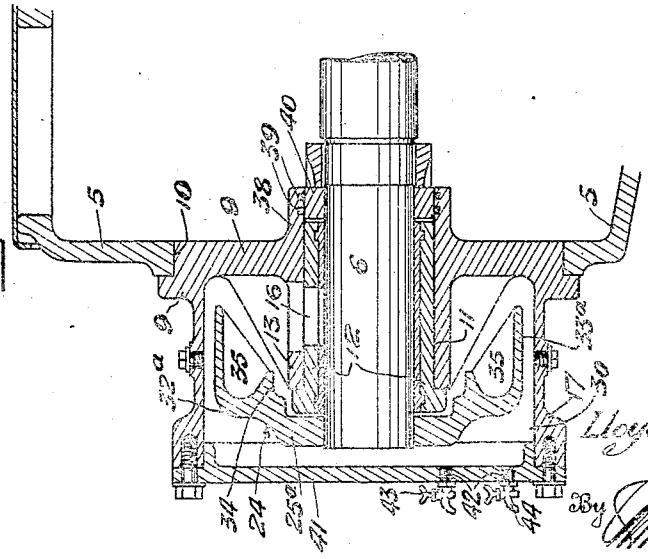

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Fig. 4.

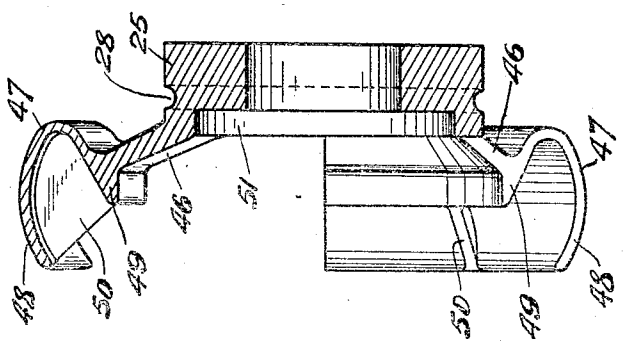
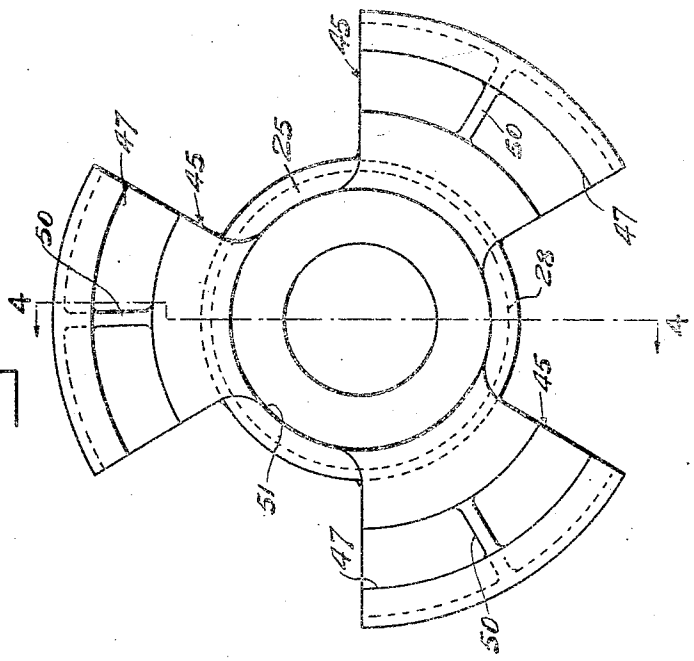


Fig. 3.



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UNITED STATES PATENT OFFICE.

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SPLASH-FEED-LUBRICATION ORGANIZATION.

Application filed June 4, 1924. Serial No. 717,784.

This invention relates to splash feed lubrication for waste packed oil lubricated bearings and particularly adapted for application to electric motor bearings, and the principal object of the same is to decrease the wear and heating of bearing surfaces through the medium of a housing or end closure that is dust proof and oil tight and provided with a novel and effective splash feed lubricating organization.

A further object of the invention is to decrease oil consumption by making the housing or end closure positively oil tight and also reduce maintenance cost by providing devices by which the maximum and minimum oil levels may be readily determined.

With these and other objects and advantages in view, the invention primarily consists in a novel construction of a dust-proof, oil-tight housing or end closure together with an effectively operating splash feed lubricating organization, and also in the various detail construction and arrangement of the several parts and combination of cooperating components, all of which will be more fully hereinafter described and claimed.

In the drawings:

Fig. 1 is a longitudinal vertical section taken centrally through the pinion or driving head extremity of an electric motor, showing the improved splash feed lubricating organization applied thereto;

Fig. 2 is a view similar to Fig. 1, showing the improved organization applied to the commutator or current-collecting end of an electric motor and illustrating a slight variation in the construction and arrangement of the parts;

Fig. 3 is an elevation of a combined oil splash ring and thrust collar embodying further variations in the construction and constituting one of the essential features of the invention; and

Fig. 4 is a transverse vertical section on the line 4—4, Fig. 3.

The improved splash feed lubricating organization is shown applied in the drawings to an electric motor, but it will be understood that it is proposed to use the same in connection with any other mechanism to which it may be found applicable and serviceable in effecting the functions and advantages incident to the improved organization. It will also be understood that the housing or end closure may be modified to adapt the same to various types of bearing structures without in the least departing from the general principle and spirit of the invention, and furthermore changes in the proportions and dimensions as well as the minor details of construction may be adopted without in the least departing from the essential features of the improvement.

Referring to Figs. 1 and 2 of the drawings, the numeral 5 designates the frame of an electric motor, which is constructed as usual in accordance with various types of machines of this class, and disposed within this frame in the usual manner is a shaft 6 which, as illustrated in Fig. 1, has a rotor 7 secured thereto. As shown by Fig. 1, the shaft 6 is extended and reduced to receive a driving gear 8, whereas in Fig. 2 the shaft 6 terminates in a butt end, as is common in electric motors.

The improved organization includes a housing 9, which is preferably in one piece casting and ribbed to lighten the same without reducing the necessary strength thereof, and has its outer diameter machined or recessed, as at 10, for projection into and close engagement with the motor frame 5, to which it is suitably secured against movement. The housing 9 is cored out and machined on its inner diameter, as at 11, Fig. 1, to receive a bearing 12 and hold it in place on the shaft 6, the inner diameter of the housing and the bearing being shaped for snug association and retention of the bearing. To reliably place and hold the bearing 12 and the central portion of the housing 9 in position relatively to the bearing, the center of the said housing has an annular hub flange 13, which is machined out, as hereinbefore explained, the recess produced by machining the said hub flange extending only partway through the length of the flange to leave an inner annular collar or projection 14, which closely embraces the shaft 6 and has suitable recesses therein for receiving felt dust rings 15, to form a tight dust-excluding joint at this point. The upper portion of the flange 13 and the bearing 12 are also formed with alined openings 16 therethrough to permit the lubricant to be fed to the shaft in a maner which will be hereinafter explained. The housing 9 also has an outer annular flange 17, to which is se-

cured an end plate 18 by suitable fastening devices, this end plate being also annular and having a central opening 19 of considerably greater diameter than the shaft 6. The annular flange 17 at the upper and lower portions thereof is formed with screw-threaded ports 20 and 21 normally closed by screw plugs 22 and 23, the said ports serving respectively as means for supplying and draining the oil from the lubricating organization.

One of the most essential features of the improvement is a combined oil splash ring and thrust collar generally designated by 24 and having a central collar member 25, which is suitably secured to the shaft 6, this collar member being of the same outside diameter as the opening 19 through the end plate 18, and fitted in the wall of the opening 19 are dust rings 26, which exclude dust from this part of the organization. The end plate 8 has a semi-annular rib 27, which projects over an annular groove or oil-receiving channel 28 formed in the upper inner portion of the collar member 25, to effect a regular drainage of the oil from the outer portion of the splash ring member 29 and conduct the said oil to the lower part of the organization or into a sump 30. The splash ring member 29 is composed of a series of segmental parts as illustrated in Fig. 3, and each part comprises a supporting member 31 projected inwardly from the inner portion of the collar member 25 and having an oil-carrying member 32 formed with an outer long flange 33 and an inner shorter flange 34, the said flanges being intermediately divided by a partition rib 35, which strengthens the same and also facilitates in providing oil pockets. A gear case 36 is applied over the projected end of the shaft 6 and the gear 8 and engages an annular shoulder 37 formed at the outer central portion of the end plate 18, this gear case advantageously contributing to the enclosure of the bearing and effective operation of the improved lubricating organization by excluding direct engagement of dust or dirt at the joint between the collar member 25 and the wall of the opening 19 of the end plate 18.

In the application of the improved device as shown by Fig. 2 the structure is essentially the same as that just explained except that the outer flange 33^a of each oil-carrying member 32^a is longer than the flange 33 of the member 32 shown by Fig. 1, and the thrust collar member 25^a of the combined oil splash ring and thrust collar is of smaller dimensions than the member 25 shown by Fig. 1. A further variation in construction shown by Fig. 2 is that the inner central portion of the housing 9 or the hub flange 13 is formed without the collar or projection 14 as shown by Fig. 1 and extends longitudinally straight, as at 38, and has at its inner terminal dust rings 39, which directly engage a collar 40 on the shaft 6. In the structure shown by Fig. 2 also an end plate 41 extends fully across the outer terminal of the improved organization and is secured to the outer annular flange 17 of the housing 9 and constitutes a final closure, the only openings formed in the body of the end plate 41 between the outer fastening means therefor and screw-threaded openings 42 for upper and lower stop cocks 43 and 44. The slight variations in construction just explained in the application of the improvement as shown by Fig. 2 do not in the least change the general operation of the essential features of the invention, said features being the same in both applications, and those parts in Fig. 2 which have not been particularly referred to as having variations in structure have reference characters applied thereto similar to those applied to Fig. 1. In the variation of structure shown by Fig. 2 the collar member 25^a is also formed without the oil-receiving channel or groove 28 shown by Fig. 1, and the oil at the outer side of the combined oil splash ring and thrust collar shown by Fig. 2 will flow downwardly over the end of the shaft into the sump 30. The inner annular hub flange 13 of the housing 9 and the bearing 12 also have communicating openings 16 similar to the structure shown by Fig. 1, to permit the oil thrown inwardly by the oil splash ring to readily pass to and lubricate the shaft 6.

The structure shown by Figs. 3 and 4, which illustrate the combined oil splash ring and thrust collar, is essentially the same as the similar devices heretofore described, and as hereinbefore specified, each combined splash ring and thrust collar will be composed of a series of segmental members or oil carriers 45 radiating from the central thrust collar member 25, there being by preference three of these oil carriers arranged equal distances apart with relation to the said thrust collar member. In the structure shown by Figs. 3 and 4 the supporting members 46 extending outwardly from the inner portion of the thrust collar member 25 are disposed at an inward angle of inclination and the oil carrying members or cups 47 stand at a corresponding inclination and have outer inwardly curved comparatively long flanges 48 and inner flanges 49 having inner straight walls merging into the inner walls of the flanges 48, the members or cups 47 being centrally divided by a partition rib 50, as in the construction heretofore described. The inner side of the thrust collar member 25 is also formed with a circular recess or seat 51, to permit the said collar and oil splash ring to be fitted up close to the remaining parts of the improved organi-

zation and particularly with respect to the outer terminal of the bearing 12. In this structure, also, the channel or groove 28 surrounds the thrust collar member 25, to receive the oil flowing from the outer side of the carriers 45 and conduct such oil back or downwardly to the sump.

The operation of the improved oil splash ring and thrust collar component is very simple, and as the same rotates with the shaft the oil is carried up by the pockets in either form of the latter illustrated and thrown inwardly and over upon the upper portion of the hub flange 13 and through the alined feed openings 16 in the said flange and the bearing 12, and thereby reaches the shaft 6, with efficiency in lubricating the latter and overcoming the numerous disadvantages incident to heating and wear of the cooperating parts of the bearing. It is also obvious that a part of the oil will reach the shaft at regular intervals with economy in the use of the oil. Furthermore, in accordance with the jointure between the several parts, exterior and interior leakage of the oil will be obviated and dust and grit will be entirely excluded from the improved bearing. The supply of oil may be replenished through the upper port 20 by removing the plug 22 and afterwards replacing the latter, and when found necessary, the oil may be drawn from the sump through the lower port 21 by removing the plug 23. Moreover, as shown by Fig. 2, the level of the oil to be maintained within the structure may be readily controlled through the use of the two cocks 43 and 44, the upper cock indicating the maximum allowable oil level and the lower cock the minimum allowable oil level. The oil splash ring is so designed in each form shown as to cause the longer outer flange or blade to throw the oil inwardly more efficiently at high speeds, and the inner shorter flange or blade in each instance is so shaped as to throw the oil better at low speeds.

In addition to the advantages hereinbefore specified in connection with the improved lubricating organization, the use of the oil cocks will give better results in maintenance and fewer bearing failures, and these cocks constitute a more positive means of control as to the supply of oil necessary in the organization than the means heretofore used in connection with waste packed oil lubricated bearings. It is also possible to reduce the bearing dimensions in view of the improved positive lubrication and also the weight is reduced, and as a consequence there will be a material saving in power.

What is claimed as new is:

1. In a splash feed lubricating organization of the class specified, the combination with a shaft, of a bearing therefor having an opening through the same, a housing cored out and machined on its inner diameter to receive the bearing, the center of the said housing having an annular hub flange engaging over the bearing and having an opening extending partway therethrough coinciding with the opening in the bearing, and an oil splash ring and thrust bearing member of unitary structure applied to the shaft, the splash ring having outer inwardly projecting pockets, the housing receiving the oil which is delivered by the pockets of the splash ring to the hub and bearing.

2. In a splash feed lubricating organization of the class specified, the combination with a shaft having a bearing with an opening therethrough, a housing with a hub extending over the bearing and also provided with an opening therein in communication with the opening of the bearing, the housing serving as means to receive the oil, and a unitary thrust collar and oil splash ring applied to the shaft and having outer peripheral pockets projected from the inner side of the ring over the hub and bearing, the pockets being formed with the inner open portions divided by intermediate transverse partitions for carrying oil and throwing the same inwardly onto the hub and shaft bearing.

3. In an oil splash feed lubricating organization of the class specified, the combination with a shaft having a bearing with an opening therethrough, of a housing for a portion of the shaft and bearing, said housing having an inwardly projecting hub fitted to and held closely in connection with the bearing and provided with an opening communicating with the opening through the bearing, and a unitary thrust collar and oil splash ring secured to the shaft and operating within the housing, the splash ring being provided with outer oil-carrying pockets which project inwardly over the hub and bearing and have inner open sides for effecting a delivery of the oil directly onto the hub and bearing, an end closure being applied to the thrust collar of the unitary splash ring and collar and secured to the housing.

4. In an oil splash feed lubricating organization of the class specified, the combination with a shaft having a bearing with an opening therethrough of an enclosing housing for a portion of the shaft and bearing and having an inwardly projecting hub closely embracing the bearing and provided with an opening therethrough communicating with the opening of the bearing, the housing being formed with shoulder means to abut against one end of the bearing, and a unitary thrust collar and splash ring secured on the shaft, the splash ring having outer inwardly projected pockets to deliver the oil directly over the hub and bearing.

5. In an oil splash feed lubricating organ-

ization of the class specified, the combination with a shaft and bearing therefor having an opening therethrough, of a housing for a portion of the shaft and bearing provided with a hub extending inwardly over the bearing and also formed with an opening communicating with the opening of the bearing, and an oil splash ring mounted on the shaft and having radially disposed, inwardly opening and inclined oil pockets which project over a portion of the bearing and hub, the interior of the housing between the splash ring and the bearing and hub being open to the said pockets for unobstructed deposit of the oil upon the hub and bearing, the pockets having outer long flanges projected longitudinally into the open space in the housing and shorter lower flanges to effect a throwing of the oil against the inner wall of the housing and downwardly onto the bearing and hub.

In testimony whereof I have hereunto set my hand.

LLOYD EDWIN ARNOLD.